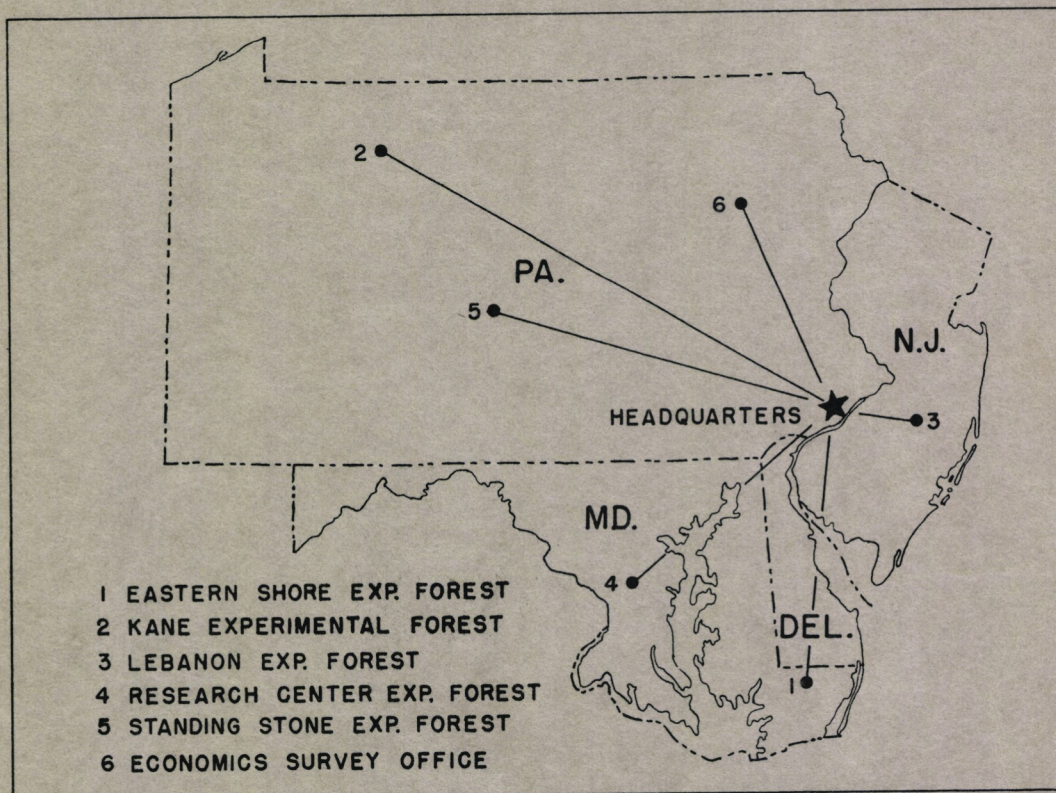


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ANNUAL REPORT ALLEGHENY FOREST EXPERIMENT STATION 1939



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EXPERIMENT STATION

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Report of the
Allegheny Forest Experiment Station
for 1939

The four States, Pennsylvania, New Jersey, Maryland, and Delaware, contain some 20,000,000 acres of forest land, and some 3,000,000 acres of abandoned farm land probably destined ultimately to revert to forests. The region is generously endowed with many valuable and rapidly growing tree species; the climate and soils are favorable to forests; and the dense population and highly developed industries place a heavy and diversified demand upon the services and products of the forest. Moreover, stimulated by public spirited citizens, among them some of the nation's outstanding leaders in forestry, these States were among the first to establish State Forestry Departments: Pennsylvania's department was created in 1895, New Jersey's in 1905, Maryland's in 1906, and Delaware's in 1927. Nowhere in the United States would one expect to find a comparable area better suited for intensive forest management.

Yet even with the advantages of good soil, heavy demands for timber products, and valuable species, progress towards permanent management of private forest properties is discouragingly slow. Over most of the region timber markets remain disorganized in the face of periodic heavy demands; and when good markets prevail, they have merely encouraged the stripping off of immature timber. Cities still draw their water supplies from polluted sources; floods still destroy approximately \$6,600,000 worth of property annually; in South Jersey and the anthracite coal region fires still burn more than 2.5 percent of the forested area annually; and the recreational needs of some 15,000,000 people are still inadequately met.

What can be done to convert heavy demands into sustained markets; to make good markets lead to better silviculture; to restrict forest fires in the regions most in need of a forest economy; to clothe abandoned, eroding farmlands with a protective and productive tree cover; to make clean, pure water available for municipal use; to lessen the damage caused by floods; to maintain an abundant wildlife without overtaxing the forest; to provide health-restoring outdoor recreation to millions of city dwellers; and to furnish the unemployed with creative work of permanent human benefit? In short, how can the forests be made to contribute their full share towards meeting the many vital individual and social needs of the 15,000,000 people dwelling in the region? It is with this complex question in mind that the Allegheny Forest Experiment Station reviews the region-wide forestry situation, assays its own past accomplishments, and draws its plan for enlarged service in the future.

Federal and State Forest Lands

Notable progress has been made in acquiring and improving public forest lands. The Federal Government now owns 440,000 acres in the Allegheny National Forest; the State of Pennsylvania has 1,651,000 acres of State Forests and 610,000 acres of State game lands; New Jersey has 55,000 acres of State Forests; Maryland 66,800 acres; and Delaware 3,000 acres. Most of these forest lands, though not yet on a uniform sustained yield basis, are being managed for permanent timber production, watershed protection, public recreation, and wildlife improvement. The same is true of the some 148 county and municipal forests that occupy approximately 86,000 acres, though on these, timber production must usually be subordinated to other uses such as public recreation and watershed protection. The total area in public forests is close to 3,000,000 acres, or approximately 17 percent of the present forest land.

Federal ownership within the boundary of the Allegheny National Forest is unlikely ever to exceed 614,000 acres. No other national forest is located within the four states. State ownership in New Jersey increased rapidly from 1925 to 1935, but little increase has occurred since then. The Department of Conservation and Development proposes that a total of 500,000 acres ultimately be acquired for State Forests. The program in Delaware is just getting under way with the goal set at 50,000 acres of State forest land. Acquisition began in Pennsylvania in 1898, and increased rapidly until 1910 when the State owned more than 900,000 acres. Little increase occurred during the next 16 years, but during 1926 to 1933 State acquisition was renewed. Since 1933 acquisition has been almost at a standstill. Though the Department has estimated that as much as 3,800,000 acres additional might be acquired by the State of Pennsylvania should Fulmer Act funds become available in generous amounts, no such increase appears likely to materialize within the next decade or two. State forests in Maryland occupied 1,900 acres in 1906 when the State Forestry Department was organized. No substantial increases occurred until 1929, but from then on State ownership has steadily increased. Recent additions have been made largely from lands purchased by the Resettlement Administration. State Forest ownership is expected ultimately to include approximately 400,000 acres. In all states, funds for acquiring forest land are seriously curtailed at present, and, unless other means than state purchase become active, no substantial increase in state managed forests is anticipated. Furthermore, because blocks of timberland large enough for State Forests are limited, it appears unlikely that purchases during the next two decades will bring the total State and Federal forest land in this region to much more than 4,000,000 acres.

Community and County Forests

Just as private forestry will never be on a sound basis until the individual landowners are convinced that private forest management is feasible at present and pays in the long run, so also counties and communities cannot be induced to engage in managing forest land unless the benefits from so doing are understood by them in terms of income from former tax-delinquent lands, wages for labor, permanently useful work for unemployed, recreational opportunities for youth, permanent wood-using industries in the communities, and other tangible benefits commensurate with the public cost and effort involved. The Station is now engaged in weighing forest benefits against cost in the anthracite coal region, where the press of unemployment threatens to overburden existing relief facilities unless new industries, among them forestry and wood products manufacture, can be developed. A study will be made of the extent to which local communities can feasibly engage in forest land management. The results, though based upon local conditions, may be expected to be generally applicable throughout the region. Should this and other efforts to stimulate community forests be fruitful, a substantial area of forest land may ultimately be owned and administered by local governmental units. What the total area may become no one can predict, but in view of the record during the past two decades it is very unlikely that communities in this territory will own more than 500,000 acres by the end of the next decade.

Private Forest Ownership

Allowing for substantial increase in publicly owned forests, the bulk of the land, approximately 16,000,000 acres, seems destined to remain in private hands for many years to come. Improving forest practice on this land is one of the major forestry objectives of the region. According to 1935 census data, farm woodlands occupy 5,500,000 acres. Other forms of private ownership including industrial ownership and tax-delinquent land account for 11,500,000 acres.

Though a ready market for products of all sizes is a requisite for intensive forest practice, good markets alone do not insure good forestry. Actually, those lands located closest to wood using industries are the very ones that today support the poorest timber stands. Repeated culling for such products as mine timbers and fuel wood converts seedling stands to sprout stands, and tends to encourage the more rapidly growing and less desirable species at the expense of those producing high quality timber products.

Owners and operators of wood using industries need to recognize more clearly that regular and sustained production of forest products leads to permanent forest industries, permanent employment, and a

permanent market for forest products. Intermittent forest production leads to temporary forest industries, temporary employment, and disorganized markets for forest products. This is the condition prevailing throughout most of the territory today. Even where permanent wood-using industries have developed, these, with possibly a few exceptions, have purchased timber with no regard whatsoever as to how it was cut or where it came from. Consequently, as local supplies were exhausted, the industries became dependent on more and more distant sources. At least one manufacturer has at last recognized that it is decidedly to his own interests to encourage local woodland owners to cut their stands conservatively and to manage them on a sustained yield basis. Such action is constructive. It, together with such other favorable factors as truck logging, improved portable saw mills, and an awakening consciousness on the part of private owners of the need for organized marketing, can go far towards offsetting forces leading to disruption. Some phases of timber marketing problems are now being investigated by State College. The Station has hoped that it will be possible to go further into this question with funds made available for farm forest research.

In certain parts of the territory, notably North Jersey, the volume of standing timber has shown a marked increase during the past fifty years. This has resulted chiefly from the purchase of country estates by wealthy people. Such timber holdings represent a reserve supply that might be drawn upon in the event of an extreme national emergency; but with rare exceptions they are not being managed as forest producing properties, nor are they open to the general public for recreation. It would be sanguine to expect that wealthy individuals are going to engage in timber growing as a hobby on a sufficiently extensive scale to meet the region's requirements for locally grown timber. The great majority of private forest land must be made to yield a definite and regular income to the owner if it is to be properly cared for. The outstanding problem becomes, therefore, how can the owner of the present more or less depleted forest stands get an adequate return from the forest, and at the same time build up its future productive capacity? And such a question is by no means unreasonable. At the present time the Station has information based on permanent sample plots established in 1906 on how loblolly pine can be managed on a permanent basis. Information on hardwoods is more extensive. However, there is need of analyzing, supplementing, and arranging this material in a form most useful to local woodland owners.

The Region's Flood Control and Water Supply Problems

Four major river systems -- the upper Ohio, the Delaware, the Susquehanna, and the Potomac, flow in and through the Station's territory. Along the banks of these major river systems are located most of the large industrial centers. Floods cause heavy loss to property, acute suffering and anxiety to those driven from their homes, and loss of human life from drowning, exposure, and disease. Three of these rivers, the Ohio, the Delaware, and the Potomac, are valuable for navigation, and all of them are important in supplying water for

municipal use. Actually, municipal and industrial uses already severely tax the water resources of the region, especially during dry years. This is the more acute because pollution of streams with mine water, sewage, and industrial waste has already rendered major supplies unsatisfactory.

This deplorable situation can be met in part by reducing pollution, but this alone will not clear the streams of objectionable silt that fills reservoirs, destroys aquatic life, clogs harbors, and costs tremendous sums to remove from municipal supplies. This is especially important during floods, but both high and low water stages are of major concern to the territory. What is needed is not so much an increase in annual discharge as a more equable flow throughout the course of the year. To what extent forests on the headwaters of these streams may contribute to a more uniform year-long flow is not known. Yet the major watershed problems of the territory cannot be intelligently met until this information is available.

A problem limited in geographic coverage but of major industrial importance is how to control the entrance of water into mines. The mining industry has long recognized that removal of mine water is an inescapable part of the mining operation, but when seventy tons of water must be removed for every ton of coal mined, as is now the case in some of the anthracite mines, the entire mine is jeopardized. Not only that, but when one mine must be abandoned because of excessive flooding, and consequently is no longer pumped, the burden falls the more heavily on those operations that continue due to underground seepage and connection. Water cannot be excluded completely from mines, but if rapid filling immediately after heavy rains could be prevented by maintaining a forest cover capable of intercepting rainfall and of causing much of it to be absorbed and held by the soil, pumping would not be overburdensome.

A Broader Service Required of the Station

During the first ten years of the Station's existence, its entire attention was devoted to forest management research. Three years ago, it embarked on flood control surveys, and last year on forest economics. During the past thirteen years, the Station and its personnel have accumulated a useful stock of information on how forest stands originate, how they develop, and how they are reproduced. The Station has also made a survey of the success on past forest planting. There is now need to reconsider the results of these studies, and to weld our fund of existing information into a system of forest management suited to the economic needs of present day timber owners, and consistent with the biological requirements of the stands. Gaps in existing information must be filled in by additional research, much of which can be accomplished by means of short-time studies in existing stands. The whole must be presented in popular and concise form suited to the needs of practicing foresters, extension specialists, farmers, and other timber land managers.

But conducting research and publishing results do not insure prompt adoption of improved methods in the field. Closer integration of the Station's activity with that of extension workers, farm foresters, and public and private timber land managers is needed. Participation by Station personnel in field days, timber marking schools, demonstrations and other meetings in which problems are discussed on the ground with forest managers and extension specialists is an indispensable first step in getting forest research into practice and in keeping research in touch with needs. Notable progress in gearing research work to the needs of forest practice has been made in New Jersey; this has resulted in each activity making more effective the accomplishments of the other.

It is not anticipated that the Allegheny Forest Experiment Station will be able to meet all forest research needs of the territory - nor is it desirable that it should. Strong, independent agencies and workers are needed to give proper balance to the program and independent review of the work. The need exists for strengthening forest research where it is now a recognized activity, for stimulating other agencies to undertake forest research, and through informal meetings with the Agricultural Experiment Stations, the State Forestry Departments, the Pennsylvania State Forest School, the University of Pennsylvania, the University of Pittsburgh, and other research institutions in the territory to inform one another of the work in progress and the fields not yet properly covered.

Accomplishments and Plans

Forest Management

The territory of the Allegheny Forest Experiment Station contains three broad forest types: the oak-pine forests of the coastal plain, the oak forests that extend from the coastal plain back into the Allegheny Plateau, and the northern hardwood forests of the Plateau.

The Oak-Pine Type

In New Jersey most of the land occupied by this type is now dominated by young sprout oaks that have arisen following cutting and fire. These oak sprouts have a high percentage of defect, and yield only cordwood. Pines, being faster growing and free from defects, are more desirable. How to increase the percentage of pine is a question of major importance. Both complete exclusion of fire and frequent burning have been found to favor oak. The Station, in cooperation with the Department of Conservation and Development of New Jersey has launched a two-fold attack upon this problem. The results obtained show that pine seedlings become established after the turfy layer is dug up by mechanical means or burned by fire. Much yet

remains to be done to work out a practical technique by which either fire or mechanical treatment can be applied to the forests to bring about natural pine reproduction.

One of the important contributions made jointly by the Station and the New Jersey Department of Conservation and Development during the past year was in the field of fire protection in the oak-pine type. Fuel type manuals for both North and South Jersey were prepared and will be published by the State. A revised method of appraising forest fire damage in New Jersey has been completed. The Appalachian Fire Danger Meter has been adjusted for New Jersey conditions. The adjusted meter showed fire hazard from average to extreme for a 54-day period in the spring, in which 63% of all fires occurred, and these fires burned over 95% of the total acreage burned during the year. The cost of controlling these fires was 82% of all expenditures. The new meter forecasted New Jersey fire conditions correctly 81 percent of the time; the All Region-7 meter, 56 percent of the time. Further adjustments in the meter will be made during the current year. Analyses of past fire records in New Jersey are being completed, and will soon be ready for publication.

In 1938, the Station, in cooperation with the Department of Conservation and Development of the State of New Jersey, drew up a program of research for the next five-year period. Prominent among the problems needing attention were fire protection and regeneration of pine stands. It is gratifying to report that substantial progress has been made on both of these. The other two, an economic survey of South Jersey forest lands, and possibilities of maintaining existing cedar swamps and restoring those that have been converted to other species, are yet to be attacked. During the past year, this entire program was reconsidered, and a new problem analysis for the whole of South Jersey drawn up. This provides for a research program of a little more than five years' duration, in which fire control, silviculture of the oak-pine type, and silviculture of the cedar swamps are included.

General volume, stand, and yield tables for the mixed upland oak type, and stand and volume tables for loblolly pine, have been prepared. A detailed study of the growth of loblolly pine in Worcester County, Maryland, has just been completed as a part of the general survey incident to the establishment of a sustained yield unit in this territory. The Station had as a background for this work the results from a series of permanent sample plots established in 1906.

Plans for next year include a problem analysis for the entire oak-pine type in Delaware and Maryland, similar to the analysis that has already been prepared for South Jersey. High in importance in this new problem analysis will be a consideration of methods of handling holly. A large part of the nation's supply of holly that adds to the gaiety of Christmas festivities throughout the land is produced in the States of Delaware and Maryland. This industry brings in an income of three-quarters of a million dollars to the residents engaged

in the harvesting of holly and the manufacturing of holly branches into Christmas wreaths. Maryland has already found it necessary to exercise control over the harvesting of holly, to prevent the destruction of the trees. The amount of holly that can be harvested, and the influence of methods of harvesting branches on the production of future branches and berries should be investigated, in order that this industry may be perpetuated. There is need for extending the Station's fire control studies to Maryland and Delaware. It is expected that further modifications of the danger meter will be required to obtain accurate predictions of fire hazards in this territory.

With the completion of the headquarters buildings, dwellings, and staff quarters at the Eastern Shore Experimental Forest, and with the development of road and trail systems, the Station is now in a position to undertake more detailed studies of the silviculture of loblolly pine in eastern Maryland. The most immediate problem is to determine how loblolly pine stands thirty to fifty years of age can be improved by making partial cuttings on a commercial basis that will yield a net return to the forest owner, yet leave the stand in the best possible condition for continued high current growth.

The Oak Type

The greater part of the Station's territory is occupied by the oak type, which extends from the coastal plain up to the Allegheny Plateau. The largest number of industries and the bulk of farming land is concentrated in this region. The volume, stand, and yield tables prepared for oak are based partially on material gathered in this territory.

The most outstanding recent contribution to the management of the oak type was the publication in October, 1939, of U. S. D. A. Technical Bulletin No. 684, "Butt Rot in Unburned and Sprout Oak Stands", by Roth and Sleeth, in which the Station cooperated. This bulletin contains data applicable to oak forests throughout the territory, but particularly to those of the oak type of Pennsylvania and Maryland. The outstanding findings brought out are that sprouts that originate at or near the ground line, as is usually the case following fire, are relatively free from decay; whereas, those that arise as much as four inches above the ground line are quite susceptible. This study is very encouraging to those who own sprout oak forests, in that it indicates most of the trees can be brought up to cross-tie sizes before rot results in an appreciable reduction of the merchantable volume.

The need for additional silvicultural studies in this type is particularly urgent, inasmuch as such studies must provide the basic information needed for forest improvement measures in the anthracite coal region and for most of the forest improvement to be done on farms in Pennsylvania and western Maryland. The Station has an experimental forest in Standing Stone Valley, Huntingdon County, Pennsylvania, but

has not yet been able to launch an important investigating program for this type. The immediate task ahead is to prepare a problem analysis for the entire oak type. It is hoped that this task can be undertaken in the very near future.

Northern Hardwoods

The hardwood-hemlock forests of the Allegheny Plateau have been the most intensively studied of any in the Station territory. Active work was begun in 1928 and has been continuous to date. In the past, major attention has been given to studying those fundamental biological factors that underlie the growth of forest stands in this territory. At the same time, a substantial amount of information has been accumulated relative to the results of various silvicultural practices in the hardwood-hemlock type. It has been shown, for instance, that harvest cuttings that result in the removal of as much as 60% of the total volume do not modify unfavorably the composition of the resulting stands, provided sound rather than cull trees are left. In culled old growth stands, a high percentage of defect occurs. Early cuttings in them must therefore be confined almost entirely to defective trees if current growth rate is to be maintained. Though second growth stands are usually of good composition, if these are logged at an early age before advanced seedling reproduction has become established, the third growth stand is likely to be made up chiefly of sprouts and of the less desirable species. Timber stand improvement measures to effect better composition and to convert such poor quality third-growth stands into thriftily growing young forests that can be managed on a long rotation, are already being investigated on the Kane Experimental Forest. Valuable information may be expected from these plots within the next three or four years.

During the past year, the Station has made rapid progress in getting into final form a manuscript dealing with the entire problem of managing hardwood stands of the Allegheny Plateau. This covers all phases of the problem, and brings up to date our knowledge of how such stands originate, develop, and mature under natural conditions, and how they respond to various methods of management. Early completion of this manuscript is high in the priority of Station tasks.

Forest Planting

More than 3,000,000 acres of forest land in the Station's territory have been so severely denuded by commercial logging, followed by repeated fires, that they no longer support adequate stocking of valuable tree species. It is estimated that an additional area of 3,000,000 acres of abandoned farm land must also be planted to trees, if it is to be returned to a productive basis within a reasonable period of time. Public and private agencies have, since 1900, planted some 225,000 acres. Recent surveys show that the average survival in plantations has been only about 35%; such a record is far from reassuring. Best results have

been obtained on abandoned farm land, poorest results on land occupied by pin cherry, aspen, scrub oak, and other woody and herbaceous species that overtop and suppress the planted trees.

The Station, with CCC funds made available to it by the Pennsylvania Department of Forests and Waters and Region 7, is now engaged in a survey of the older plantations in northwestern Pennsylvania. Preliminary results from this survey indicate that best results, everything considered, have been obtained from the planting of red pine. This survey should be completed, and if practicable, extended to the rest of the Station's territory. Sidelines of this investigation have been the development of a well-aerated collapsible crate for shipping planting stock by truck, the construction of special heel-in beds for use on planting jobs, and the development of a woven-wire pannier for carrying stock in the field.

Culm and refuse banks in the anthracite and bituminous coal regions disfigure the landscape, and are the source of much coal and silt that blackens the streams. Exploratory studies in culm bank afforestation were continued during the past year at the Botany Department of the University of Pennsylvania, in cooperation with Mr. Stanley Mesavage. Methods of stabilizing these banks by means of vegetation are sorely needed.

Forest Pathology

The Bureau of Plant Industry has since 1931 maintained a laboratory of Forest Pathology at Philadelphia in cooperation with the Station and the University of Pennsylvania. Three main lines of activity have been followed: (1) A survey of diseases of forest trees in the Allegheny region. Besides providing a disease diagnosing and advisory service to foresters, nurserymen, and tree specialists of this territory this service led to the discovery of a new disease of plane trees hitherto unknown in the United States. (2) A study of mycorrhiza of forest trees. Much useful knowledge of the types of fungi that are associated with tree roots and leads as to the possible physiological relationship between the tree and the fungus were gained from this study. (3) Diseases of tree seedlings in Allegheny nurseries. This latter activity has absorbed almost completely the energies of the staff during the past two years.

Aluminum sulphate has long been used by nurserymen as an aid in controlling damping-off of conifer seedlings; but the degree to which the aluminum-ion augmented or detracted from the action of the hydrogen-ion in impeding the growth of the fungi concerned was obscure. In detailed experiments in which concentrations of aluminum were varied independent of pH it was found that the aluminum-ion was effective in reducing damping-off only at concentrations that reduced the growth of red pine seedlings.

Studies on the effect of acidity on resistance to damping-off showed that seedlings grown at low pH (3.5) become more resistant than those grown at high pH (5.5). Protection of seedlings against possible disease organisms present on the surface of the seed coat is often necessary in seed testing, seedling culture studies, and even in nurseries. It was found that exposing seed of red or ponderosa pine to the vapors of formalin killed surface borne fungi. Much practical aid in meeting disease problems has been given to Stato and other nurserymen in the region.

Forest Economics

With the appropriation of \$18,000 during the current fiscal year for a study of forest employment possibilities in the anthracite coal region, the Allegheny Station formally began its first economics project. The problem involved is to determine to what extent unemployed labor can be expended in building up the forests of the region to provide raw materials for permanent wood using industries and aesthetic surroundings attractive to recreationists.

Due to unavoidable delay in selecting personnel for this study progress has been limited to making a new problem analysis, preparing a working plan, initiating work on a forest ownership map for Luzerne County, and exploring the usefulness of aerial photography for preparing a forest cover map. A large number of agencies directly concerned with any action program that might result have been informed of our plans and have promised their cooperation in the work. The immediate task is to compile facts needed by action agencies in launching a modest program. The big obstacle to an immediate action program is the lack of publicly owned land. Existing legislation limits the extent and character of public works that can be carried out on private lands. Full exploration of the need for additional legislation probably will be required. Acquisition of forest land by counties and local communities appears at present to be a necessary step before important action programs can be started. Ultimate plans will provide for a logical division of ownership among various public and private agencies.

The problem is sociologic as well as economic. Before any program to build up the forest wealth of the anthracite region can be launched successfully, a keener appreciation of forests and of the beauty, healthful recreation, and inspiration they contribute to the community must be built up in the minds of the local people. Forest fires must be checked. And everyone must learn to appreciate that those who protect and care for forests enrich the region as a whole; whereas those that overcut, burn, or otherwise abuse forest land impoverish the entire region. A coordinate attack along many lines is essential to the success of this enterprise.

Flood Control Surveys

Floods in the Allegheny Station territory cause losses averaging \$6,600,000 annually, an impressive sum indeed; but in the heavy floods of 1936 damage in Pennsylvania alone exceeded \$210,000,000. During the two years that Flood Control Surveys have been operating, preliminary examinations leading to recommendations for surveys were made on the Lehigh, Youghiogheny, Kiskiminitas, Conemaugh, Patuxent, Codorus, and Allegheny Rivers. Surveys were found unnecessary on the Poquest and Passaic Rivers. To date only two surveys have been completed, the Codorus Creek and the Youghiogheny River. On Codorus Creek some 6,500 acres of farmland were found to need conversion to forests. On the Youghiogheny 87,000 acres are in need of reforestation, but uncertainty exists as to what reduction, if any, in flood crests would result from restoring this land to forest.

Flood Control Survey parties have been handicapped by a paucity of usable basic data that would enable them to evaluate precisely the extent to which improved land management practices will reduce the damage caused by floods, and by so doing represent a legitimate charge against flood control funds. No one denies that land practices wisely adjusted to the soil and topography conserve fertility, reduce the rapidity of runoff, and often add to low water flow; yet what this means in terms of tons of soil retained, reduction of flood crests in feet, and added cubic feet of flow during dry periods cannot be computed at present. Plans for the next year include temporary field studies of how snow cover and runoff of snow water are affected by forests, how runoff from sample watersheds is affected by vegetation, and the extent to which vegetation affects the rate at which water enters the soils. Though these studies admittedly must be extensive rather than intensive, it is believed that they are essential before public agencies can plan the safest and most economical flood control measures. Plans for next year include in addition preliminary examinations of the Schuylkill River and the Raystown Branch of the Juniata, the initiation of a survey on the Lehigh.

Conclusion

In forest management, flood control, and forest economics, the Station can point with pride to specific accomplishments during the past year that brings nearer our major objective of making the forests of the region serve more completely the needs of the populace. Matched against the magnitude of the problems still facing the profession it is modest indeed, and as such it serves rather to point out the lines along which future endeavor is likely to be most productive. Forest research must be a sustained and continuing effort because it deals with long lived plants that grow to maturity over a period of several decades, and with man's ever changing demands on those plants to meet specific daily needs. As each year's research is added to that of the

past the whole becomes more and more useful. Forest research workers must scrutinize with extreme care the work that is done today and the plans of the past and future, realizing full well that present ill conceived plans may mean prolonged waste of valuable effort. The obligation and challenge to build wisely and well the foundation for future forest improvement through research is equal in importance to that of interpreting the results of past research to fill the needs of current forest practice.

The Allegheny Station has a small staff and has within its territory only one forest school. The territory also is small, but its importance as a timber producing region to supply needs of its own industries is large. The Station needs to grow in size to discharge its obligations more completely, and it needs to grow to become a more efficient research unit. But growth must be based upon need and past accomplishments. The personnel confidently anticipate that as the Station contributes more and more to the forestry needs of the region, growth in size and efficiency will inevitably follow.

APPENDIX

ALLEGHENY FOREST EXPERIMENT STATION

PERSONNEL

1939

OVERHEAD ADMINISTRATION

Hardy L. Shirley	Director
Hazel L. Stiles	Senior Clerk
Margaret R. Evans	Clerk

FOREST MANAGEMENT

G. Luther Schmur	Silviculturist
Ashbel F. Hough	Assistant Silviculturist
Alonzo B. Crow	Junior Forester
John E. Hetzel	Junior Forester
Silas Little, Jr.	Junior Forester
Carl E. Ostrom	Junior Forest Ecologist
Ralph P. Broomall	Assistant to Technician
Eli J. Fenchak	Minor Assistant to Technician
Frederick H. McClemmen, Jr.	Minor Assistant to Technician
Merritt J. Harding	Field Assistant
John C. Muller	Field Assistant
Lillian E. Taylor	Senior Clerk, Statistical
Katherine F. McKeaney	Junior Stenographer

FOREST ECONOMICS

Reginald D. Forbes	Senior Forester, In Charge
Clement Mesavage	Junior Forester
Evelyn Manzi	Junior Stenographer

FLOOD CONTROL

Arthur Bevan	Senior Agricultural Economist, In Charge
Wm. Mollenhauer, Jr.	Forester
Frank F. Tuthill	Associate Forester
Charles H. Diebold	Assistant Forester
Richard J. MacConnell	Assistant Engineer (Hydraulic)
Raymond W. Pierce	Assistant Engineer (Hydraulic)
Emil F. Meyer	Junior Forester
Earl J. Rogers	Junior Forester
Harry R. Slayback	Assistant to Technician
Edward Bogdziewicz	Assistant Engineer Draftsman
Marshall T. Augustine	Field Assistant
Harold L. Mitchell	Field Assistant
Eileen M. Fry	Assistant Clerk-Stenographer
Florence Aronson	Junior Stenographer

BUREAU OF PLANT INDUSTRY

L. W. R. Jackson	Assistant Pathologist, In Charge
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Mimeographed

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- Schnur, G. Luther Volume tables for Loblolly Pine (Pinus taeda L.). Tech. Note #25.

ADVISORY COUNCIL

Allegheny Forest Experiment Station

<u>Present Members</u>	<u>Term</u>	<u>Expiration</u>
Francis R. Cope, Jr., proprietor Woodbourne Dairy and Orchards, Dimock, Pa.		1941
E. O. Ehrhart, forest engineer Armstrong Forest Company, Johnsonburg, Pa.		1941
Dr. O. E. Jennings, head Department of Biology, University of Pittsburgh, Pittsburgh, Pa.		1941
Henry W. Leeds, manager Chalfonte-Haddon Hall, Atlantic City, N. J.		1941
J. Spencer Smith, Tenaflly, N. J. President New Jersey Board of Commerce and Navigation.		1941
Ezra B. Whitman, engineer Whitman, Requardt and Smith, Baltimore, Maryland.		1941

Recommendation has been made for re-appointment of six members whose terms have expired, and for the appointment of thirteen new members.

RS-AL
SILVICULTURE
Silvics

PROJECT STATUS SHEET

January 31, 1940

SILVICS

FIELD DIVISION: Forest Management Research

WORK PROJECT: Silviculture

LINE PROJECT: Silvics, oak-pine

PURPOSE:

To determine the silvical characters of the principal species and the ecology of stands, including the environmental factors which affect their natural regeneration by seed or sprout, as the basis for silvicultural practices.

REVIEW OF PAST WORK:

Seed production of oak and pine; seed dispersal of pine and southern white cedar; effect of site, animals, and insects on reproduction in the oak-pine type; and effect of seedbed conditions on reproduction have been studied and reported in 13 technical notes and papers in various journals.

ACCOMPLISHMENTS DURING PAST YEAR:

Mechanical seedbed treatment removing the turfy layer or digging it up was found to encourage shortleaf pine (*P. echinata*) reproduction in New Jersey. Raking of litter is ineffective. The leaf area of first year sprouts on chestnut oak (*Q. montana*) was found to be only 13% of that of the parent tree. A portion of the root system dies immediately after the parent tree is cut. Persistence of stems per sprout clump in oak coppice in southern New Jersey in decreasing order was found to be as follows: white, chestnut, black, and post oaks.

PLANS FOR NEXT YEAR:

Continue phenological observations on the Lebanon Forest and summarize existing records. Summarize data on pine and southern white cedar seed dispersal, and prepare for publication. Commence a study on successional stages on the lowland sites in southern New Jersey to determine the sequence and climax and the factors controlling the sequence as a basis for southern white cedar (*Chamaecyparis thyoides*) management.

DATE OF COMPLETION:

1942.

ASSIGNMENT:

Schnur, Little, McClennen.

RS-AL
SILVICULTURE
Stand improvement

PROJECT STATUS SHEET

January 31, 1940

STAND IMPROVEMENT

FIELD DIVISION: Forest Management Research

WORK PROJECT: Silviculture

LINE PROJECT: Stand improvement, oak-pine.

PURPOSE:

To determine and demonstrate the effect of various stand improvement measures on the composition, growth, and quality of forest stands prior to harvest cuttings, and the cost and efficiency of given methods.

REVIEW OF PAST WORK:

Published results of a thinning study in 13-year mixed oak in New Jersey indicates that vigorous sprouting rapidly fills openings, discouraging seedling reproduction or interplanted stock. Demonstration thinnings of Virginia pine (*P. virginiana*) in Maryland show the desirability of early thinnings (about 10 years of age) in dense, stagnant, old-field stands, with two later thinnings reducing stand to 700 trees per acre at 25 years.

Demonstration thinning and pruning of 25-year plantation white pine (*P. strobus*) indicate the desirability of thinning 6X6 plantations at 15-20 years of age. Pruning with a hand saw climbing up the tree and working down is the most desirable of many methods tested.

ACCOMPLISHMENTS DURING PAST YEAR:

None.

PLANS FOR NEXT YEAR:

Continue observations on existing plots and short-term studies.

DATE OF COMPLETION:

Mixed oak thinnings 1960-70; Virginia pine 1960-70.

ASSIGNMENT:

Schnur.

RS-AL
SILVICULTURE
Stand improvement

PROJECT STATUS SHEET

January 31, 1940

STAND IMPROVEMENT

FIELD DIVISION: Forest Management Research

WORK PROJECT: Silviculture

LINE PROJECT: Stand improvement, beech-birch-maple-hemlock.

PURPOSE:

To determine the effect of various stand improvement treatments on the composition, growth, and quality of immature stands and to devise practical methods by which large acreages of second growth forest may be improved as sources of forest products.

REVIEW OF PAST WORK:

Weedings in 13 to 18-year-old reproduction cost up to \$10.00 per acre and are not a cure-all for stands inadequately stocked with desirable trees such as the usual inferior third growth. To avoid decay hazards in thinning of multiple stems, weedings should be made before the stand reaches 20 years of age. Commercial thinnings in 40-year-old second growth, removing 1/3 of cordwood volume, result in little advance growth and break the crown canopy causing danger of glaze damage and sunscald. Lighter thinnings are advisable, and, if made from above in black cherry-sugar maple mixtures, stimulate growth of desirable sub-dominant stems. Mowing advance growth and desprouting stumps may be effective pre-weeding stand improvement measures. Pruning lower limbs of hardwood crop trees should supplement weedings in more open stands.

ACCOMPLISHMENTS DURING PAST YEAR:

Only routine maintenance work was done on this project.

PLANS FOR NEXT YEAR:

Analyze 5-year remeasurements of thinned plots and publish results. Currently examine plots on Kane Experimental Forest.

DATE OF COMPLETION:

Continuing, with studies completed currently; pruning, mowing, stump sprouting 1945; thinning plots 1972; weeding plots 1976.

ASSIGNMENT:

Hough, Ostrom.

January 31, 1940

FOREST PLANTING

FIELD DIVISION: Forest Management Research

WORK PROJECT: Regeneration

LINE PROJECT: Planting

PURPOSE:

To determine the silvical and economic factors governing the restoration of depleted or denuded forest lands by planting or other treatments.

REVIEW OF PAST WORK:

Coniferous interplantings were made in young oak coppice in southern New Jersey in 1930-1933 to supplement inadequate stocking and to improve composition. Two release cuttings have been made. Preliminary results are available in two published articles.

In cooperation with Lake States Station, red pine from 50 seed sources and 9 climatic regions were planted in 1937 at Kane, Pa. Annual records include survival, vigor, and growth. A study of 3-10 year old plantations on Allegheny Forest and adjacent areas in 1936-37 indicate species best adapted to various sites and conditions. Study of size of stock, methods of planting, and species adaptation on difficult sites started in test plantations in 1938.

ACCOMPLISHMENTS DURING PAST YEAR:

A guidance leaflet for CCC planting in northwestern Pennsylvania was published. Improved methods of handling, shipping, and holding planting stock were suggested and put in practice on Allegheny National Forest. A test plantation for study of method of storing stock, season of planting, and deer injury, was established. A survey of older plantations in northwestern Pennsylvania on State and private lands in cooperation with the Pennsylvania Department of Forests and Waters was begun.

PLANS FOR NEXT YEAR:

Analyze data on New Jersey interplanting study and prepare a report. Prepare preliminary report on red pine source-of-seed study. Complete present phases of survey of older plantations and prepare results for publication. Examine 1938 and 1939 test plantations, analyze records and prepare report.

DATE OF COMPLETION:

1945 for interplanting study.
1977 for red pine source of seed study.
1940 for plantation surveys and test plantations unless additional funds become available.

ASSIGNMENT:

Schnur, Little (O-P); Hough, Hotzol (B-B-M-H).

RS-AL
MENSURATION
Stand studies

PROJECT STATUS SHEET

January 31, 1940

STAND DEVELOPMENT, GROWTH AND YIELD ^{1/}

FIELD DIVISION: Forest Management Research

WORK PROJECT: Mensuration

LINE PROJECT: Stand studies

PURPOSE:

To determine the rates of growth and yield of stands, and to analyze the factors governing growth and development as a basis for sound forest management.

REVIEW OF PAST WORK:

Growth and development studies of loblolly pine were begun by the Forest Service in Maryland in 1906 and maintained in cooperation with the Maryland State Department of Forestry. Results of past studies were published in one Maryland State Bulletin and two Journal of Agri. Research articles. In cooperation with R-7, U. S. F. S. and Maryland State Department of Forestry, a growth study on a 50,000 acre sustained yield unit in Worcester County, Maryland was started.

Regional volume, stand, and yield values for upland oak forests of the eastern United States were determined in cooperation with the Appalachian and Central States Stations. Results of this study are available in U. S. D. A. Technical Bulletin #560.

ACCOMPLISHMENTS DURING PAST YEAR:

The loblolly pine sustained yield growth study was completed. Mean annual diameter increments of 0.16 - 0.18 inch occurred on pine and 0.10 - 0.15 inch on hardwoods. The average number of loblolly pines dying in a 5-year period was 42% for 2-inch trees, 9% for 8-inch, 1% for 12-inch, and 0% for trees above 16 inches d.b.h. Volume tables for loblolly pine were published in Technical Note #25.

PLANS FOR NEXT YEAR:

Prepare papers on (1) comparison of tree volumes in oak; (2) growth of loblolly pine. Remeasure loblolly pine permanent sample plots. Make problem analysis of oak-pine type in Delaware and Maryland.

DATE OF COMPLETION:

Indefinite.

ASSIGNMENT:

Schnur and Crow.

1/ All stand studies combined in this one project.

RS-AL
SILVICULTURE
Silvics

PROJECT STATUS SHEET

January 31, 1940

SILVICS

FIELD DIVISION: Forest Management Research
WORK PROJECT: Silviculture
LINE PROJECT: Silvics, beech-birch-maple-hemlock
PURPOSE:

To determine the silvical characteristics of species, and the ecology of stands, as the bases for silvicultural practices.

REVIEW OF PAST WORK:

Drought, glaze, frost, and wind, within the general climatic region of the Allegheny Plateau, have been found to cause widespread losses in mature stands and to influence the initiation of new stands. Minor soil differences were found to have little effect on composition and growth of stands, but major features such as poor drainage, or high clay content markedly influenced both composition and growth. Fungal damage was found to depend on past stand treatment and to be greater among drought injured trees. Hardwood competition has almost completely eliminated the high yielding white pine and has seriously reduced the amount of hemlock. Repeated fires favor aspen and pin cherry at the expense of valuable conifers and hardwoods. Deer browse on all hardwoods but rabbits prefer maples and beech.

ACCOMPLISHMENTS DURING PAST YEAR:

The life histories of 120 and 290 year-old stands of white pine show that these originated following catastrophes in the virgin forest caused by wind and fire. Hemlock likewise follows catastrophes, especially those caused by drought and hemlock borer. Beech and sugar maple were found to be typically all-aged in original forests, an expression of aggressive reproduction that withstands suppression. Beech, sugar maple, and hemlock should all be favored in selective cutting. Black cherry, white ash, yellow poplar, and basswood depend for successful regeneration on minor to large openings such as those produced by group selection, strip, or clear cuttings. Birches and red maple were found to be even-aged, but silvically are less desirable.

PLANS FOR NEXT YEAR:

A Departmental circular or bulletin on the silvics and ecology of this type will be completed. Further studies will be made in stands cut over at various times during the past to check the conclusions reached from studies in virgin stands, and to form the basis for more detailed recommendations on silvicultural practice.

DATE OF COMPLETION:

Continuing, except for publication above noted.

ASSIGNMENT:

Hough, Ostrom.

RS-AL
SILVICULTURE
Harvest cuttings

PROJECT STATUS SHEET

January 31, 1940

HARVEST CUTTINGS

FIELD DIVISION: Forest Management Research

WORK PROJECT: Silviculture

LINE PROJECT: Harvest cuttings, beech-birch-maple-hemlock.

PURPOSE:

To determine commercial methods of harvesting timber that will result in high mean annual yield and perpetuation of desirable species.

REVIEW OF PAST WORK:

Careful selection of individual stems in a partial cutting of 60-year-old second growth with holdovers on Allegheny National Forest, followed by selective removal of inferior and damaged elements as chemical wood, left the stand in best shape to produce future sawtimber. Cutting to a 10-inch diameter limit was less successful, since mortality of the reserved stand was high. Mature stands containing advanced growth of desirable species can be clearcut with the assurance that a good stand will follow, but clear cutting in immature second growth stands leads to poor quality third growth in which decay susceptible stump sprouts and pin cherry are dominant.

ACCOMPLISHMENTS DURING PAST YEAR:

The ability of suppressed elements in stands, especially sugar maple, to grow rapidly following partial cutting has been proven. This fact makes partial cutting on a tree selection basis a practical way to assure rapid volume and value increment and to keep the stand in a state of high productivity. Black cherry-sugar maple mixtures are best adapted to such treatments.

PLANS FOR NEXT YEAR:

A comprehensive study of sawtimber harvest cutting methods on Allegheny National Forest and privately owned land in the beech-birch-maple-hemlock forest region will be made. Data already available will be published.

DATE OF COMPLETION:

Continuing project.

ASSIGNMENT:

Hough, Ostrom.

RS-AL
FIRE
Behavior

PROJECT STATUS SHEET

January 31, 1940

BEHAVIOR OF FIRE

FIELD DIVISION: Forest Management Research

WORK PROJECT: Forest fire protection

LINE PROJECT: Behavior

PURPOSE:

To obtain information relative to forest fire behavior necessary for the formulation of sound policies and plans for fire protection. Includes studies of rate of spread, fuel type classification, resistance to control, and fire weather relations.

REVIEW OF PAST WORK:

Studies in the oak-pine type of New Jersey were started in 1936 in cooperation with the New Jersey Forest Fire Service and R-7, U.S.F.S.; preliminary analytical studies of State fire records were completed the same year. Data from 70 fires analyzed in the spring of 1939 indicate the rate of spread to be three times faster in the pine than in the oak types. The effect of several weather factors on fire occurrence (1935-37) was determined and a report written in 1938.

ACCOMPLISHMENTS DURING PAST YEAR:

A fire danger meter for temporary use was prepared for New Jersey conditions by adjustment of the Appalachian type 3 meter. A comparison of danger ratings with fire occurrence, size, and cost for 1935-38 showed that in the central division of New Jersey 63% of all fires occurred during 54 days in March, April, and May that had a danger rating of average to extreme; and that these fires accounted for 95 percent of the total burned area and 82 percent of the total suppression costs. The R-7 (type 5-A) danger meter was tested for New Jersey conditions with one year's fire weather records, and was found to forecast correctly only 56% of the time.

PLANS FOR NEXT YEAR:

Prepare report giving results of 1938-39 tests on R-7 danger meter tests. Using the R-7 meter, adjusted for New Jersey conditions, test against fire weather records from March to December, 1940. Analyze results and prepare report.

DATE OF COMPLETION:

1944.

ASSIGNMENT:

Schnur, Little, McClennen.

RS-AL
FIRE
Control

PROJECT STATUS SHEET

January 31, 1940

CONTROL OF FIRE

FIELD DIVISION: Forest Management Research

WORK PROJECT: Forest fire protection

LINE PROJECT: Control

PURPOSE:

To obtain information essential to the sound planning of forest fire control. Includes elapsed time, cost, transportation, and water supply studies.

REVIEW OF PAST WORK:

Preliminary work was started in New Jersey in 1936. Analyses of 1935-37 time and cost records established certain trends. Transportation and water supply studies on 186 fires showed that tank trucks could have been used advantageously on 86 percent of them. Methods of mapping and classifying roads and water supplies for fire protection purposes were determined.

ACCOMPLISHMENTS DURING PAST YEAR:

1. Cooperated with New Jersey Forest Fire Service in preparation of fuel type manuals for both North and South Jersey. Joint reports prepared.
2. Cooperated with New Jersey in revision of method of appraising forest fire damage. Joint report prepared.
3. Punch card analysis of New Jersey 1931-38 forest fire records completed and tables prepared.

PLANS FOR NEXT YEAR:

Prepare manuscript on forest fires in New Jersey for publication.

DATE OF COMPLETION:

1940.

ASSIGNMENT:

Schnur, Little, McClennon.

RS-AL
FIRE
Effects

PROJECT STATUS SHEET

January 31, 1940

EFFECTS OF FIRE

FIELD DIVISION: Forest Management Research

WORK PROJECT: Forest fire protection

LINE PROJECT: Effects

PURPOSE:

To determine the effects of fire on the tree, the forest, and the site in order to supply the basic information necessary for the formulation of sound silvicultural and fire protection policies and plans. Studies include damage to standing trees and the site, also effects of controlled fires on seedbed conditions and species composition.

REVIEW OF PAST WORK:

Comparative fire resistance determined for six important tree species, 1930. Establishment of 80-acre controlled burning experiment in 1936-37 in cooperation with the State of New Jersey. Fire damage to standing trees was found to be reduced by use of safety-strip method of preparing firebreaks as against broadcast burning with no pre-treatment.

ACCOMPLISHMENTS DURING PAST YEAR:

None.

PLANS FOR NEXT YEAR:

Continue treatments on controlled burning study according to plan. Establish new controlled burning plots in cooperation with the New Jersey Department of Conservation and Development and the CCC (CCC Demonstration Plots) to determine:

1. Number of annual burns necessary for the preparation of a seedbed for pine.
2. Value of preliminary thinnings used with controlled burning in obtaining pine reproduction.
3. Effectiveness and cost of controlled burning in comparison with mechanical treatments for seedbed preparation.

DATE OF COMPLETION:

1952 for all studies.

ASSIGNMENT:

Schnur, Little, McClennen.

RE-AL

PROJECT STATUS SHEET

SOCIAL ASPECTS

Employment

Anthracite survey

January 31, 1940

FOREST EMPLOYMENT POSSIBILITIES, ANTHRACITE COAL REGION

FIELD DIVISION: Forest Economics Research

WORK PROJECT: Private forestry

LINE PROJECT: Financial aspects

PURPOSE:

To determine the extent and character of possible forest employment in the anthracite coal region, now and in the future.

REVIEW OF PAST WORK:

None. New project, begun in Fiscal Year 1940.

ACCOMPLISHMENTS DURING PAST YEAR:

Personnel recruited and administrative plans laid. General working plan nearly complete. Project discussed with large number of agencies as basis for cooperation. Usefulness of aerial photographs explored. Land ownership map Luzerne County partially completed.

PLANS FOR NEXT YEAR:

Preparation, in cooperation with State and local agencies, of intensified plan for fire protection: General for region, specific and detailed for sample area (in Luzerne County). Completion of ownership maps, and survey of tax delinquency, as basis for developing park, recreation, and local beautification programs. Preparation from aerial photographs and ground surveys of maps showing current land use, forest types and conditions, erosion, etc. Study of local emergency labor and direct relief programs, and their adaptability to proposed forest employment.

DATE OF COMPLETION:

The survey of immediate employment possibilities should be completed by July 1, 1941. The study of a permanent forest economy and employment, based on sustained yield, will require an additional two years.

ASSIGNMENT:

Forbes, Mesavage, consultant (University of Pennsylvania).

RI-AL

FLOOD CONTROL

Preliminary examinations

PROJECT STATUS SHEET

January 31, 1940

PRELIMINARY EXAMINATION, FLOOD CONTROL

FIELD DIVISION: Flood control surveys

WORK PROJECT: Flood control surveys

LINE PROJECT: Preliminary examinations, flood control

PURPOSE:

In cooperation with the Soil Conservation Service and the Bureau of Agricultural Economics to determine from preliminary examinations of watersheds assigned to Committee 2 (Station chairmanship) and 3-b, as listed in the Flood Control Act of 1936, and its amendments, whether there is need for a flood control survey.

REVIEW OF PAST WORK:

Preliminary examinations in 1938 of the Lehigh, Youghiogheny, Kiskiminitas and Conemaugh in Pennsylvania and the Patuxent in Maryland brought out the existence of improper land management practices that result in heightened flood stages and channel silting on these streams and the need for flood control surveys.

ACCOMPLISHMENTS DURING THE PAST YEAR:

Heavy runoff from steep farmland in the Codorus Watershed was found to aggravate the flood menace at York. A survey was recommended. A survey was also found to be needed on the Allegheny to determine what changes in land practices would be needed to safeguard and render more effective engineering works for flood control. The serious flood problem on the Passaic (New Jersey) Watershed was found not to be due to erosion or inadequate vegetative cover, but to the drainage pattern. No survey was recommended. Flood abatement on the Pequest (New Jersey) Watershed was found to require channel improvements.

PLANS FOR NEXT YEAR:

The examination of the Schuylkill River in Pennsylvania will be completed; a report on the Raystown Branch of the Juniata (Pennsylvania) will be made; and work will be started on the Raritan River (New Jersey).

DATE OF COMPLETION:

Schuylkill Watershed, July, 1940; Raystown Branch of Juniata River, September, 1940.

ASSIGNMENT:

Mollenhauer, Morang, Lippert, Rogers, Bogdziewicz.

RI-AL

FLOOD CONTROL

Watershed surveys

PROJECT STATUS SHEET

January 31, 1940

WATERSHED SURVEYS, FLOOD CONTROL

FIELD DIVISION: Flood control surveys

WORK PROJECT: Flood control surveys

LINE PROJECT: Watershed surveys, flood control

PURPOSE:

In cooperation with Soil Conservation Service and Bureau of Agricultural Economics, to design flood and erosion control programs on watersheds assigned to committees 2 (station chairmanship) and 3-b, as listed in Flood Control Act of 1936, and subsequently amended.

REVIEW OF PAST WORK:

Flood control surveys were begun in 1938, but no watersheds were completed that year.

ACCOMPLISHMENTS DURING PAST YEAR:

A remedial program was worked out for Codorus Creek, Pa., that provided for reforestation of 6,528 acres of farmland. The Youghiogheny, Pa., watershed just surveyed contains some 87,000 acres in need of reforestation; though the extent to which such work will reduce flood losses is believed, on much of the land, to be problematical. Lack of data on runoff conditions under various forest cover types makes it impossible on many surveys to determine whether the costs of forest improvement measures can be justified by resulting flood control benefits.

PLANS FOR NEXT YEAR:

Work will be continued on the Allegheny Watershed. This will include snow surveys, infiltration studies, and small watershed gage installations, which will provide a sounder basis for evaluating the benefits to be derived from specific land use practices. A survey of the Lehigh Watershed has been approved, and a Survey Work Outline is now being prepared.

DATE OF COMPLETION:

Indeterminate depending on funds. On present funds, not less than four years.

ASSIGNMENT:

Mollenhauer, Morang, Lippert, Meyer, Tuthill, Pierce, Mitchell, Aaron, Fenchak.